International Journal of Mental Health Nursing

International Journal of Mental Health Nursing (2021) *30*, 1550–1561 doi: 10.1111/inm.12905

ORIGINAL ARTICLE

Prevalence and severity of verbal, physical, and sexual inpatient violence against nurses in Swiss psychiatric hospitals and associated nurse-related characteristics: Cross-sectional multicentre study

Nanja Schlup, [1] ***Beatrice Gehri*** [2,3] ***and Michael Simon*** [2,4]

[1]*Solothurn Hospital Group, Solothurn, Switzerland,* [2]*Institute of Nursing Science, Department of Public Health, Faculty of Medicine, University of Basel, Basel, Switzerland,* [3]*University Psychiatric Clinics, Basel, Switzerland, and* [4]*Nursing Research Unit, Department of Nursing, Inselspital Bern University Hospital, Bern, Switzerland*

ABSTRACT: *This analysis (1) describes the prevalence and severity of psychiatric inpatient violence against nurses in Switzerland's German-speaking region and (2) investigates the associations between nurse-related characteristics (socio-demographics; previous exposure to severe forms of psychiatric inpatient violence; attitude towards psychiatric inpatient violence) and nurses' exposure to various types of psychiatric inpatient violence. We used cross-sectional survey data from the Match*^{RN} *Psychiatry study sample of 1128 nurses working on 115 units across 13 psychiatric hospitals. In addition to lifetime severe assaults, nurses' exposure to violence against property, verbal violence, verbal sexual violence, physical violence, and physical sexual violence was assessed for the 30 days prior to the survey. Descriptive statistics (frequency and percentage) were calculated for each class of violence as also for items under study. With generalized linear mixed models, odds ratios and 95% confidence intervals were calculated. Of nurse respondents, 73% reported facing verbal violence, 63% violence against property, 40% verbal sexual violence, 28% physical violence, and 14% physical sexual violence. Almost 30% had been subjected to a serious assault in their professional lifetimes. All nurse characteristics were associated with psychiatric inpatient violence against nurses, especially a history of sexual assault (OR 4.53, 95%-CI 2.19–9.34;* P = *0.00) and ≤3 years' professional experience (OR 3.70, 95%-CI 1.95–7.02;* P = *0.00). Prevalence data suggest that widely used strategies such as aggression management courses or alarm devices cannot fully reduce patient violence against nurses in psychiatry. This situation demands proactive strategies in safety and violence prevention.*

KEY WORDS: *aggression, inpatient, prevalence, psychiatry, violence.*

INTRODUCTION

Patient violence against nurses is a severe and common problem in psychiatric settings, especially in inpatient psychiatry (Duncan *et al*. 2001; Estryn-Behar *et al*. 2008), leading to serious negative consequences for nurses, inpatients, and organizations (Cooper & Swanson 2002; Zhang *et al*. 2017). Besides physical injuries, nurses can suffer psychological repercussions, including stress, feelings of fear or anger (Moylan *et al*. 2016; Stevenson *et al*. 2015), or even post-traumatic stress disorder (Jacobowitz 2013). Consequently, their institutions may face decreased job satisfaction (Bowers *et al*. 2009; Verhaeghe *et al*. 2016), increased absenteeism (Arnetz & Arnetz 2001;

Correspondence: Michael Simon, Institute of Nursing Science, Department of Public Health, Faculty of Medicine, University of Basel, Basel, Switzerland. Email: m.simon@unibas.ch

Declaration of conflict of interest statement: All authors have declared that they have no conflicts of interest.

Nanja Schlup, MScN.
Beatrice Gehri, MScN.
Michael Simon, PhD RN.

Accepted June 17 2021.

Hamrin *et al*. 2009), and elevated staff turnover (Cooper & Swanson 2002).

Despite numerous investigations aiming to understand, predict, and manage psychiatric inpatient violence against nurses, this occupational burden is still common (Moylan & Cullinan 2011; Pekurinen *et al*. 2019; Ridenour *et al*. 2015). Considering the widely acknowledged need to identify and implement effective strategies to reduce psychiatric inpatient violence (Gaynes *et al*. 2016), research to describe the prevalence and predictors of psychiatric inpatient violence against nurses is needed (Phillips 2016).

BACKGROUND

The World Health Organization (WHO) defines violence as 'the intentional use of physical force or power, threatened or actual, against oneself, against another person, or against a group or community, which either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation' (World Health Organization 2002). Past studies focusing on psychiatric inpatient violence mostly categorized violence according to whether it was manifested verbally or physically (Bilgin 2009; Ridenour *et al*. 2015; Zerach & Shalev 2015). However, few have acknowledged sexual violence as a separate form of psychiatric inpatient violence (Flannery *et al*. 2011; Shiao *et al*. 2010; World Health Organization 2020).

The prevalence of psychiatric inpatient violence varies considerably across studies and countries (Spector *et al*. 2014). Possible reasons include not only cultural differences but also varying recall periods – the implication being that greater recall periods lead to a greater risk for reporting bias (Althubaiti 2016). Regarding its professionallifetime prevalence, a Turkish study in a psychiatric setting found that 61% of nurses were affected by physical assaults by patients (Bilgin 2009). In Switzerland, Abderhalden *et al*. (2002) found that 73% of nurses recalled feeling seriously threatened at least once; and almost 70% had experienced one or more physical attacks by patients during their professional lives. In acute locked psychiatric units, prevalence is far higher: in an American survey of nurses on such units, almost 85% of nurses reported exposure to verbal violence and nearly 80% to physical violence over the past 30 days (Ridenour *et al*. 2015).

Inpatient violence against nurses has a complex, multifactorial nature, reflecting diverse patient, nurse, unit, and organizational factors and their interactions (Di Martino & Chappell 2000; Nowrouzi-Kia *et al*. 2019). Various nurse-related characteristics have been examined, but with inconsistent findings. For example, the role of gender has been repeatedly studied to examine, among other matters, whether females or males face higher risks for psychiatric inpatient violence; but the results remain inconclusive (Edward *et al*. 2016; Moylan & Cullinan 2011; Pekurinen *et al*. 2019).

On the other hand, significant associations between professional experience (Moylan & Cullinan 2011; Ridenour *et al*. 2015), job qualification (Estryn-Behar *et al*. 2008), age (Pekurinen *et al*. 2019; Ridenour *et al*. 2015), and nurses' previous exposure to psychiatric inpatient violence have been found. Moreover, Moylan and Cullinan (2011) found that, once exposed to severe inpatient violence, nurses had a higher risk for further exposure. In addition, nurses who considered patient violence part of their job were found to be at a higher risk for psychiatric inpatient violence (Verhaeghe *et al*. 2016).

To our knowledge, this study is the first to describe nurses' exposure to verbal, physical and sexual violence, their lifetime exposure to severe inpatient violence and the association between nurse-related characteristics and differentiated types of psychiatric inpatient violence.

This analysis had two main aims: (1) to describe the 30-day prevalence and severity of inpatient verbal, physical, and sexual violence against nurses in the German-speaking part of Switzerland and (2) to investigate the association between nurse-related characteristics (socio-demographics; attitude towards psychiatric inpatient violence) and nurses' exposure to the selected types of psychiatric inpatient violence.

METHODS

Study design and setting

This analysis was part of the 'Matching registered nurse services with changing care demands in psychiatric hospitals' [Match^{RN} Psychiatry] study (Gehri et al. 2021). As a time-series cross-sectional multicentre study (2019–2021) in Switzerland's German-speaking region, Match^{RN} Psychiatry includes a convenience sample of 13 psychiatric hospitals. Match^{RN} Psychiatry aims to measure and describe factors influencing the nursing work-environment, nurse staffing, and quality of care in Switzerland's German-speaking region to improve patient-centeredness and quality of nursing care. Psychiatric inpatient violence against nurses is one of the factors contributing the nursing work-environment and quality of care.

Sample

The study sample included 1128 registered nurses [RN] and licensed practical nurses [LPN] working on 115 units of the 13 participating psychiatric hospitals. Match^{RN} Psychiatry's one inclusion criterion for units was provision of 24/7 services for adult psychiatric inpatients. Forensic departments were excluded. Three inclusion criteria applied to nurses: willingness to answer the survey; involvement in direct care; and the ability to understand spoken and written German.

Data sources, collection, and management

The nurse survey data used for this analysis were collected between September 2019 and March 2020 by the Match^{RN} Psychiatry study team. While that team's instrument was based on the nurse survey developed for the earlier Match^{RN} study (Bachnick *et al*. 2017), it also included new investigator-developed items targeting the psychiatric setting. Therefore, it was pilot-tested with 20 nurses working in the psychiatric inpatient care setting.

For data collection, each psychiatric hospital defined a local coordinator, who then acted as the contact person for the Match^{RN} Psychiatry study team. Based on the participating psychiatric hospitals' preferences, the nurse surveys were provided either on paper or online. In total, 956 paper–pencil and 735 online nurse survey questionnaires were distributed. The response rate was validated based on unit codes and reported to the local coordinator after 2 and 4 weeks of data collection. As necessary, local coordinators followed up with participant reminders. The Match^{RN} Psychiatry study's final response rate was 71.5% (range: 51–88% on the hospital level).

Questionnaires were entered by an external data entry service and checked for consistency and plausibility by the Match^{RN} Psychiatry study team. To isolate any systematic errors, 5% of the questionnaires were entered twice.

Variables and measurements

Violence was defined as 'any verbal, nonverbal, or physical behaviour that was threatening (to self, others or property), or physical behaviour that actually did harm (to self, others or property)' (Morrison 1990, p. 67).

Outcome measures

In addition to previous investigations, we assessed all three types of patient violence against nurses (verbal, physical, and sexual) with different types of severity and respective prevalence during the 30 days before the data collection.

In total, five types of psychiatric inpatient violence were assessed, each by a specific item: *(1) verbal violence; (2) verbal sexual violence; (3) violence against property; (4) physical sexual violence; and (5) physical violence*. As examples each item included clinical expressions of the relevant type of violence: (1) insults, threats to use physical violence, threats of attack outside the workplace; (2) cat-calls, demands for private meetings, ambiguous comments, displays of pornographic material, threats of sexual assault; (3) demolition or burning of objects, throwing of objects, pounding one's fist on the table, kicking at the door; (4) kiss, grooming, sexual touching (genitals, buttocks, thighs, or breasts); (5) biting, spitting on, kicking, hitting, scratching, pulling of hair. Examples of clinical expressions were based on the German-language version of the 'Perception of Prevalence of Aggression Scale' [POPAS] (Oud 2001). The POPAS is a 15-item questionnaire asking healthcare workers to rate which, if any, forms of patient violence they either experienced directly or witnessed during the last year (Oud 2001). All POPAS items are measured on a 5-point Likert-type scale (1 = never to 5 = very often).

The investigator-developed items were measured on 6-point Likert-type scales (1 = never to 6 = daily). For the subsequent analysis, items were dichotomized as '1 = no' (never) and '2 = yes' (one or more exposure during the preceding month). The items were pretested for content validity and comprehensibility with a conveniently selected sample of 30 nurses working in psychiatric inpatient care setting.

Nurse-related characteristics

Nurses' socio-demographic data were collected via the Match^{RN} study nurse survey (Bachnick *et al*. 2017). These included age, gender, educational level, employment percentage, and professional experience in nursing (years). In Switzerland, RNs require either an advanced federal diploma or a bachelor's degree (3- to 6-year education); LPNs require a federal diploma of vocational education and training (3-year education).

Nurses' *lifetime exposure to severe psychiatric inpatient violence* was assessed via two investigator-developed items. Specifically, these assessed *(1) physical attack (broken bones, deep flesh wounds, internal injuries, knocked-out teeth) and (2) sexual assault (sexual intercourse without consent, rape)* – either of which would normally require medical treatment due to their

severity. These items were measured on a 3-point Likert-type scale (1 = never, 2 = one or two times, and 3 = three times or more) and treated as '1 = no' and '2 or 3 = yes.' All examples of clinical expression were also based on the German translation of the POPAS (Nijman *et al*. 2005; Oud 2001).

To measure each nurse's *attitude towards psychiatric inpatient violence,* the questionnaire asked for their levels of agreement /disagreement with three investigator-developed items: (1) *'that patients verbally threaten nurses is part of the job in psychiatric care'*; (2) *'that patients sexually harass nurses is part of the job in psychiatric care'*; and (3) *'that patients physical attack nurses is part of the job in psychiatric care'*. Each item was measured using a 10-point Likert-type scale (0 = totally disagree to 10 = totally agree), then summarized to *'Perception that inpatient violence is part of the job'* via row means with Cronbach alpha of 0.88.

Statistical methods

All data analyses were conducted with R, version 3.6.2 (The R Development Core Team 2020). To describe the nurse sample's characteristics and the prevalence and severity of psychiatric inpatient violence (aim 1), we calculated frequencies (n), percentages (%), means, and standard deviations [SD]. To explore the association between nurse-related characteristics and nurses' exposure to different types of psychiatric inpatient violence (aim 2), we first assessed the variation in exposure between participating units and hospitals. Then, we analysed associations between nurse-related characteristics (socio-demographics, history of severe injuries due to a physical attack and/or a sexual assault, nurses' attitudes towards psychiatric inpatient violence) and exposure to the different types of psychiatric inpatient violence. Third, we analysed associations between nurse-related characteristics and nurses' exposure to psychiatric inpatient violence. We (1) constructed separate models for each of the five violence types and (2) used generalized linear mixed models [GLMMs] to account for the clustering of nurses within units. Using GLMM and the 'lme4-package' (Bates et al. 2014), we calculated odds ratios [ORs] and 95% confidence intervals [CIs] for associations between nurse-related characteristics and nurses' exposure to psychiatric inpatient violence.

Additional analysis

To check whether multilevel analysis was an appropriate method to investigate aim 2 and to explore variation between units and hospitals, we calculated intra-class correlations [ICC] for each of the five violence types at the unit and hospital levels. For this step, we used the 'rptR- package' (Stoffel et al. 2017), with an ICC of 0.05 or higher indicating non-random variation between clusters (Snijders & Bosker 2011).

To evaluate our models' robustness, we also conducted sensitivity analyses. As we were unsure whether nurse age would provide a perspective meaningfully different from professional experience in nursing, we ran each regression model adjusted for age. We also checked whether unit work-environment characteristics such as leadership, team climate, and safety climate would substantially affect our models' parameters.

Missing data

Depending on the variable, between 1% and 5% of the items were missing. To avoid losses of statistical power and to minimize potential bias when using listwise deletion, we only excluded responses missing all five items assessing psychiatric inpatient violence (n = 39, 3.3%). Finally, we analysed each model with a listwise deletion data set.

Ethical considerations

Each participating psychiatric hospital's chief nursing officer signed a written agreement supporting Match^{RN} Psychiatry. Each participating nurse received a questionnaire with an introduction explaining the study's purpose, guaranteeing confidentiality, and emphasizing that participation would be completely voluntary. Filling out and returning the questionnaire was considered informed consent. To ensure data protection and confidentiality, nurse data were fully anonymized by using ID numbers for units and hospitals with no possibility for identification of individuals. Since the nurse surveys were conducted anonymously, the Match^{RN} Psychiatry study received exempt status from all cantonal ethics committees responsible for the participating institutions (the Ethics Commission of Northwest and Central Switzerland; Project ID: Req-2019-00589).

RESULTS

Sample description

Data of 1128 nurses working on 115 units in 13 participating psychiatric hospitals were analysed. As shown in Table 1, most participants were female (70%); 88% were RNs with 3- to 6-year education. The mean

TABLE 1 *Descriptive statistics of nurse-related characteristics* (n = *1,128*)

Value	*n* (%)	Missings (%)	Mean(±SD)	Range
Socio-demographics				
Age (years)		23 (2)	40.0 (±12.68)	17–67
Gender		10 (1)		
Female	786 (70)			
Male	332 (29)			
Educational level		7 (1)		
Registered nurses	994 (88)			
Licensed practical nurses	127 (11)			
Employment percentage		27 (2)		
96–100	450 (40)			
61–95	472 (42)			
10–60	179 (16)			
Professional experience in nursing (years)		55 (5)	13.9 (±10.95)	0–45
≤3	194 (17)			
>3–≤7	179 (16)			
>7–≤15	245 (22)			
>15–≤20	145 (13)			
>20	264 (23)			
Exposure to severe forms of psychiatric inpatient violence				
Physical attack	271 (24)	4 (0)		
Sexual assault	57 (5)	1 (0)		
Attitude towards psychiatric inpatient violence †		27 (4)	3.29 (±2.67)	0–10
Verbal violence is part of the job	1121	7	4.66 (±3.21)	
Sexual violence is part of the job	1118	10	2.31 (±2.69)	
Physical violence is part of the job	1118	10	2.91 (±2.97)	

Note: *n*, Sample size, %, Percentage, SD, Standard Deviation.

†Extent of agreement, measured using a 10-point Likert-type scale (*'0 = disagree at all'* to *'10 = totally agree'*).

participant age was 40 years (±SD 12.68). On average, they had 13.9 years (±SD 10.95) of professional experience.

Prevalence of inpatient violence against nurses in Swiss psychiatry

Almost 30% (328) of nurses had been exposed to severe forms of psychiatric inpatient violence during their professional lifetime. Of these, 271 (24% of total sample) had been physically attacked and 57 (5%) sexually assaulted with serious injuries requiring medical treatment. The vast majority of participants did not perceive patient violence as part of their job (mean 3.29 (±SD 2.67), see Table 1).

During the 30 days preceding the data collection, 73% of nurses were once or more often exposed to verbal violence and 63% to patient violence against property. Furthermore, 39% of nurses had experienced verbal sexual violence, 28% physical violence, and 14% physical sexual violence once or more often in the preceding month. Table 2 represents more detailed information about the prevalence and severity of psychiatric inpatient violence against nurses in the German-speaking part of Switzerland.

Nurse-related characteristics associated with psychiatric inpatient violence

Correlations between nurse-related characteristics and nurses' exposure to psychiatric inpatient violence are shown in Table 3.

Nurse socio-demographics

The nurse socio-demographic characteristic associated most strongly with nurses' risk for exposure to psychiatric inpatient violence was *'professional experience in nursing.'* The most experienced nurses – with more than 20 years of professional experience – had the lowest risk for all types of violence. Conversely, the least experienced (≤3 years) had the highest risk for exposure to verbal (OR 3.37 [95%-CI: 1.80–6.33]), verbal sexual (OR 3.60 [95%-CI: 2.18–5.79]), and property violence (OR 2.95 [95%-CI: 1.65–5.29]). The strongest associations were found in nurses reporting seven or fewer years of professional experience (≤3 or >3

TABLE 2 *Nurses' exposure to psychiatric inpatient violence over the 30 days before the data collection*

Value	Verbal Violence *n* (%)	Verbal sexual violence *n* (%)	Violence against property *n* (%)	Physical sexual violence *n* (%)	Physical violence *n* (%)
Never	309 (27)	692 (61)	410 (36)	971 (86)	806 (71)
Once a month	284 (25)	253 (23)	326 (29)	104 (9)	214 (19)
Several times a month	180 (16)	80 (7)	186 (16)	21 (2)	61 (5)
Once per week	118 (11)	53 (5)	88 (8)	16 (2)	15 (1)
Several times a week	171 (15)	35 (3)	89 (8)	10 (1)	17 (2)
Daily	61 (6)	10 (1)	20 (2)	1 (0)	7 (1)
Missings	5 (0)	5 (0)	9 (1)	5 (0)	8 (1)

Note: *n*, Sample size, %, Percentage. Total sample of 1128 nurses.

≤7 years). Interestingly, almost no differences were found between different levels of experience of physical sexual and other physical violence.

Employment percentage was also associated with nurses' exposure to psychiatric inpatient violence. Compared to nurses working 100%, those working 10–60% had a significantly lower risk for exposure to verbal violence (OR 0.46 [95%-CI: 0.26–0.80]), violence against property (OR 0.48 [95%-CI: 0.28–0.83]), and physical sexual violence (OR 0.53 [95%-CI: 0.28–1.00]). Just outside the range of significance, those working 10–60% had a lower risk for physical violence too (OR 0.59 [95%-CI: 0.33–1.07]; $P = 0.08$).

E*ducation* and *gender* were associated with just one type each of psychiatric inpatient violence. Compared to RNs, LPNs had a 0.40 [95%-CI: 0.22–0.71] lower chance of exposure to violence against property. Furthermore, compared to female nurses, males had a 0.49 [95%-CI: 0.34–0.70] lower risk of exposure to verbal sexual violence. Male nurses were also not-quite-significantly less likely to have experienced exposure to physical sexual violence (OR 0.66 [95%-CI: 0.41–1.05]; $P = 0.08$).

Nurses' exposure to severe forms of psychiatric inpatient violence

Severe physical attacks resulting in serious injuries during one's professional lifetime were associated with all types of inpatient violence, although the correlation for verbal violence fell just below the significance level. The strongest associations were found between having a personal history including at least one physical attack and the risk for being exposed to physical violence (OR 2.03 [95%-CI: 1.32–3.11]). Very strong associations were also found between sexual assaults in nurses' histories and the risk for verbal and physical sexual violence (OR 4.04 [95%-CI: 1.89–8.65]; OR 4.53 [95%-CI: 2.19–9.34]). Additionally, the risk of exposure to verbal violence was 3.13 [95%-CI: 1.01–9.75] higher for nurses with histories that included sexual assault.

Nurses' attitudes towards psychiatric inpatient violence

Nurses' *perception that inpatient violence is part of the job* in psychiatric care was associated with their exposure to psychiatric inpatient violence. Those with a stronger perception that violence is part of the job also reported more frequent exposure to violence, although associations for verbal sexual violence (OR 1.12 [95%-CI: 1.06–1.19]), violence against property (OR 1.09 [95%-CI: 1.01–1.17]), and physical violence (OR 1.11 [95%-CI: 1.04–1.19]) were very weak.

Additional statistical analysis

As presented in Table 4, analysis showed that ICCs explained 11–56% of between-cluster variance in nurses' exposure to all types of psychiatric inpatient violence at the unit level and almost none at the hospital level. As for the sensitivity analysis, all regression models were also run with nurses' age and their unit work-environment characteristics (leadership, team climate, and safety climate, see Appendix). While age did show a pattern similar to that of professional experience in nursing, none of the work-environment variables were associated with psychiatric inpatient violence against nurses.

DISCUSSION

This explorative analysis of the Match^{RN} psychiatry study data indicated a relatively high prevalence of psychiatric inpatient violence against nurses in the German-speaking part of Switzerland. Verbal violence was most common, followed by violence against property and sexual physical violence. Less prevalent physical violence types affected one-third of nurses monthly.

TABLE 3 *Generalized linear mixed model to show associations between nurse-related characteristics and their exposure to inpatient violence*

	Verbal violence		Verbal sexual violence		Violence against property		Physical sexual violence		Physical violence	
Variable	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Gender										
Male	1.32 (0.86–2.03)		0.49 (0.34–0.70)	0.00***	0.96 (0.64–1.45)	0.85	0.66 (0.41–1.05)	0.08	1.39 (0.92–2.09)	0.12
Female (reference)	–	0.21	–	–	–	–	–	–	–	–
Education										
Licensed practical nurses	1.47 (0.73–2.93)	0.28	1.04 (0.64–1.71)	0.87	0.40 (0.22–0.71)	0.00**	1.21 (0.66–2.22)	0.53	0.87 (0.49–1.57)	0.65
Registered nurses (reference)	–	–	–	–	–	–	–	–	–	–
Employment Percentage										
10–60	0.46 (0.26–0.80)	0.01*	1.11 (0.70–1.76)	0.66	0.48 (0.28–0.83)	0.01*	0.53 (0.28–1.00)	0.05	0.59 (0.33–1.07)	0.08
61-95	0.66 (0.43–1.01)	0.05	0.91 (0.64–1.30)	0.61	0.81 (0.54–1.23)	0.32	0.73 (0.46–1.14)	0.17	0.92 (0.61–1.38)	0.67
100 (reference)	–	–	–	–	–	–	–	–	–	–
Professional experience (years)										
≤3	3.37 (1.80–6.33)	0.00***	3.60 (2.18–5.97)	0.00***	2.95 (1.65–5.29)	0.00***	1.83 (0.93–3.60)	0.08	1.13 (0.62–2.05)	0.68
>3–≤7	1.63 (0.92–2.91)	0.09	3.61 (2.17–6.00)	0.00***	2.47 (1.39–4.40)	0.00**	1.73 (0.87–3.44)	0.12	1.32 (0.72–2.43)	0.36
>7–≤15	1.61 (0.97–2.66)	0.06*	2.52 (1.58–4.03)	0.00***	2.42 (1.44–4.04)	0.00***	1.76 (0.92–3.36)	0.09	1.23 (0.71–2.14)	0.46
>15–≤20	2.69 (1.45–5.00)	0.00**	1.73 (1.01–2.94)	0.04*	2.75 (1.50–5.06)	0.00**	2.49 (1.26–4.93)	0.01*	0.98 (0.52–1.86)	0.95
>20 (reference)	–	–	–	–	–	–	–	–	–	–
Severe forms of psychiatric inpatient violence in history										
Physical attack	1.54 (0.96–2.48)	0.07	1.72 (1.18–2.51)	0.00**	1.75 (1.10–2.78)	0.02*	1.59 (1.00–2.52)	0.05	2.03 (1.32–3.11)	0.00**
Sexual assault	3.13 (1.01–9.75)	0.05	4.04 (1.89–8.65)	0.00***	2.58 (0.97–6.87)	0.06	4.53 (2.19–9.34)	0.00***	1.19 (0.54–2.58)	0.67
No history (reference)	–	–	–	–	–	–	–	–	–	–
Perception that inpatient violence is part of the job	1.04 (0.97–1.12)	0.29	1.12 (1.06–1.19)	0.00***	1.09 (1.01–1.17)	0.02*	1.06 (0.98–1.14)	0.13	1.11 (1.04–1.19)	0.00**

Abbreviations: CI, confidence interval (2.5–97.5%); OR, odds ratio.

*$P < 0.05$.

**$P < 0.01$.

***$P < 0.001$.

TABLE 4 *Intra-class correlation (ICC) of nurses' exposure to psychiatric inpatient violence*

Value	Unit level ICC (95% CI)	Hospital level ICC (95% CI)
Verbal violence	0.49 (0.29–0.68)	0.05 (0.01–0.11)
Sexually physical violence	0.21 (0.12–0.28)	0.03 (0.00–0.07)
Violence against property	0.56 (0.40–0.76)	0.06 (0.01–0.12)
Verbal sexual violence	0.11 (0.04–0.17)	0.01 (0.00–0.04)
Physical violence	0.36 (0.26–0.41)	0.02 (0.00–0.05)

Abbreviations: CI, Confidence intervals (2.5-97.5%); ICC, Intra-class correlations.

A similar proportion reported exposure to severe forms of psychiatric inpatient violence during their professional lifetime that required hospital and/or long-term treatment. The range of negative repercussions is alarming. This analysis also linked nurse characteristics (socio-demographics, lifetime exposure to severe forms of psychiatric inpatient violence, and attitude towards psychiatric inpatient violence) to recent exposure to psychiatric inpatient violence.

Our findings that nurses working in psychiatric inpatient settings are at high risk for inpatient violence are consistent with reports in the literature (Duncan *et al*. 2001; Estryn-Behar *et al*. 2008). As other investigations have done, we found verbal violence to be the most frequent type, followed by violence against property, while certain types of physical violence are the rarest (Pekurinen *et al*. 2019; Pekurinen *et al*. 2017).

As our group did, Ridenour *et al*. (2015) assessed survey data on violence against nurses by psychiatric inpatients with a 30-day recall period. Whereas they found that 85% of nurses had been exposed to verbal and 80% to acts of physical violence, our frequencies were lower: 73% for verbal and 28% for physical violence. Unlike Ridenour's group, we assessed patient violence in more detail, treating sexual violence as a separate type. Also, aggressiveness was found to be more frequent in psychiatric units in the United States than in other countries (Cornaggia *et al*. 2011), with the prevalence of psychiatric inpatient violence against nurses varying considerably across countries and clinical psychiatric settings (Spector *et al*. 2014).

When Renwick *et al*. (2019) assessed nurses' exposure to severe psychiatric inpatient violence, their findings were similar to ours: 30% of their nurses had been exposed to violence resulting in serious injuries. However, their sample only included nurses working on acute psychiatric units and assessed the year prior to the survey; therefore, their results' comparability with ours is limited. Still, this comparison supports the hypothesis that frequencies of psychiatric inpatient violence against nurses depend on specific setting and unit characteristics.

Abderhalden *et al*.'s (2002) study of nurses' perceptions of aggression in Swiss psychiatric inpatient settings showed that, while estimated incidences of inpatient aggression against nurses differed across units, the highest were consistently in acute and geronto-psychiatry. This observation was supported by our analysis of between-cluster variance, which indicated that unit ID explained 11–56% of nurses' exposure to psychiatric inpatient violence.

Unexpectedly, neither 'leadership' nor 'team- and safety climate' explained this dependency (Cowman *et al*. 2017; Hamrin *et al*. 2009; Roche *et al*. 2010). Many other unit characteristics were found to be associated with nurses' previous exposure to psychiatric inpatient violence (Hamrin *et al*. 2009; Zhang *et al*. 2017). It is possible that inclusion of physical unit characteristics such as the quantity and quality of nurse staffing, patient-to-nurse ratio/overcrowding, unit specialization, door policies or mean rates, and durations of seclusion and restraint into our models would explain these differences (Bowers *et al*. 2007; Salzmann-Erikson & Yifter 2020). Furthermore, certain psychiatric inpatient characteristics, including diagnosis and socio-demographics, which have been linked elsewhere to violence against nurses (Dack *et al*. 2013; Flannery *et al*. 2011), were outside the scope of this investigation. Determining whether specific combinations of patients on units also influence the frequency of violent events, as suggested by Red (Hamrin *et al*. 2009), will require further study.

Consistent with prior investigations, this analysis found that nurses working less than 60% had a lower risk for exposure than those working full-time – a finding confirmed elsewhere across various healthcare settings (Estryn-Behar *et al*. 2008; Hahn *et al*. 2010). This suggests that exposure to patient violence depends on the time spent in direct patient interaction. Such a relationship would certainly explain why, of all healthcare workers, nurses are most often exposed to inpatient violence (Hahn *et al*. 2010).

This analysis also indicated an inverse association between nurses' professional experience and their exposure to psychiatric inpatient violence: those nurses with <20 years of professional experience had higher risks for exposure to verbal violence, verbal sexual violence, and violence against property. However, unlike Moylan and Cullinan (2011), we found no association

between professional experience and exposure to physical violence. This may be because we examined only the relationship between non-severe forms of physical violence and nurses' professional experience.

Nurses professional experience requires further discussion in context with their attitudes towards psychiatric inpatient violence, for which our analyses also indicated an associated with exposure to psychiatric inpatient violence. Prior studies concluded their samples' less experienced nurses less likely to hold psychiatric patients responsible for their actions, more often attributing negative behaviours to their mental illness (Abderhalden *et al*. 2002; Jansen *et al*. 2005; Verhaeghe *et al*. 2016). Conversely, their more experienced colleagues, who tended to take a less sympathetic view of patient behaviour, were less tolerant. Abderhalden *et al*. (2002) found that psychiatric nurses from German-speaking countries (Germany, Austria, or Liechtenstein) ranked violence by patients lower as an undesirable phenomenon than did psychiatric nurses from other cultural/linguistic regions (Netherlands, Italy, Philippines, Korea, etc.). The missing universally valid definition of patient violence against nurses and its types of expression may promote the variability of attitudes towards across settings and countries.

In view of nurses' high professional lifetime prevalence of exposure to severe violence, the association between having experienced a physical attack or sexual assault and an increased risk for further exposure to psychiatric inpatient violence was striking. It also highlights the long-term psychological consequences of violent trauma. Feelings of hopelessness, burnout, or reduced quality of life were linked with more negative nurse attitudes towards psychiatric inpatients (Salzmann-Erikson & Yifter 2020; Whittington & Higgins 2002).

Furthermore, exposure to psychiatric inpatient violence reduces nurses' ability to empathize with patients, thereby hampering their ability to navigate potentially violent situations (Verhaeghe *et al*. 2016). As Stevenson *et al*. (2015) noted, nurses who had been the subject of inpatient violence described a change in their behaviour – an increased likelihood to resort to compulsory medication or coercive measures as a way to contain violence. Rather than avoiding violence, though, a more aggressive attitude actually increases the chances of facing it (Bilgin 2009; Yang *et al*. 2018). Additionally, exposure to specific types of patient violence impacts how nurses' report or even personally acknowledge that exposure (Jalil *et al*. 2017). Moreover, coercive measures as restraint and seclusion and violence events were negatively associated with patient violence against mental healthcare workers (Beghi *et al*. 2013).

One reasonable explanation for affected nurses' failure to report violence against them is that they simply stop considering it noteworthy, as they simply see it as part of their job. This may lead them to overlook warning signs that would otherwise trigger de-escalation strategies (Hallett *et al*. 2014; Jonker *et al*. 2008; Moylan & Cullinan 2011). That is, left on their own, nurses exposed to psychiatric inpatient violence can find themselves in a downward spiral, with the exposure to violence leading to changes in attitude, which lead in turn to increasingly severe incidents of violence. Mental health promotion training interventions or resilience training were found to have a positive effect on nurses emotion regulation skills, occupational stress, and self-efficacy (Babanataj *et al*. 2019; Bernburg et al. 2019) which might offer a chance to interrupt this downward spiral.

Limitations

To our knowledge, this is the first study to differentiate between verbal, physical, and sexual violence. However, as it is also the first use of the investigator-developed items to measure the prevalence and severity of these types of violence, the comparability of the results is limited. And although the recall period was only 30 days, the use of self-reported questionnaires, which rely on nurses' memories and introspective analyses of past experiences, may lead to recall bias in the prevalence assessment.

This cross-sectional analysis did not follow a pre-registered analysis plan and the modelling was based on thorough analyses of the dataset. This process contains several analytical decisions some being arbitrary, which is also described as the garden of forking paths (Gelman & Loken 2016). To reduce the risk of reporting bias, we also conducted sensitivity analyses exploring the potential influence of alternative variables.

To minimize misunderstandings, each item assessing psychiatric inpatient violence contained possible examples of clinical expression. Still, nurses' perceptions and attitudes towards psychiatric inpatient violence were both setting-dependent – as shown by the high ICC values – and may vary between individuals. To control between-unit-cluster variance, several work-environment unit characteristics were used; however, these failed to account for all of the variation. Alongside the study's cross-sectional design, this limits the results' generalizability and comparability across settings.

CONCLUSIONS

This analysis indicates that a relatively high proportion of nurses have been and continue to be subjected to psychiatric inpatient violence in the German-speaking part of Switzerland, leading to a range of negative outcomes and long-term negative influences. Particularly nurses with less professional experience and those whose histories include serious assaults by patients need protection. In addition, nurses' attitudes towards psychiatric inpatient violence need to be incorporated into prevention strategies.

There is a need for a universally and nationally accepted definition of patient violence against nurses in the healthcare sector, so that victims, healthcare organizations, and policy makers know exactly when they are affected (World Health Organization 2021). The established protective strategies, including aggression management training or alarm devices, apparently have limited value at reducing psychiatric patient violence against nurses, the high prevalence of which indicates major shortfalls across psychiatric settings at every policy level from the individual institution to the international healthcare association (Cowman *et al*. 2017). Ensuring best violence management practice will require collaborative cross-setting management interventions that consider nurse, patient, and unit characteristics. Therefore, policy and educational strategies are needed to develop effective preventive and interventional strategies regarding patient violence against nurses.

The impacts both of nurse-related characteristics and of unit characteristics should not be underestimated. For example, the highest risks are expected in acute and geronto-psychiatry (Abderhalden *et al*. 2002), where among others the usage of coercive measures may be reviewed. While nurses' health and safety must be made a priority in organizational culture across Switzerland, nurses in these units should be the first to receive targeted interventions as example mental health promotion training interventions or resilience training.

RELEVANCE FOR CLINICAL PRACTICE

This explorative analysis of the Match^{RN} psychiatry study data showed that, despite widespread prevention strategies, patient violence against nurses is still a common problem in psychiatric hospitals. The investigation showed that especially nurses with less professional experience and those whose histories include serious assaults by patients need protection. Additionally, the impacts both of nurse-related characteristics and of unit characteristics seemed to be associated with nurses' risk for patient violence.

ACKNOWLEDGEMENTS

We would like to thank the Association of Nursing Directors of Psychiatric Institutions in Switzerland (VPPS) and all participating nurses as well as the local coordinators.

FUNDING INFORMATION

The study was funded by the participating hospitals of the Match^{RN} psychiatry study as members of the Association of Nursing Directors of Psychiatric Institutions in Switzerland (VPPS).

REFERENCES

Abderhalden, C., Needham, I., Friedli, T.K., Poelmans, J. & Dassen, T. (2002). Perception of aggression among psychiatric nurses in Switzerland. *Acta Psychiatrica Scandinavica Supplementum*, *106(412)*, 110–117.

Althubaiti, A. (2016). Information bias in health research: definition, pitfalls, and adjustment methods. *Journal of Multidisciplinary Healthcare*, *9*, 211.

Arnetz, J.E. & Arnetz, B.B. (2001). Violence towards health care staff and possible effects on the quality of patient care. *Social Science & Medicine*, *52* (3), 417–427.

Babanataj, R., Mazdarani, S., Hesamzadeh, A., Gorji, M.H. & Cherati, J.Y. (2019). Resilience training: Effects on occupational stress and resilience of critical care nurses. *International Journal of Nursing Practice*, *25* (1), e12697.

Bachnick, S., Ausserhofer, D., Januel, J.M. *et al*. (2017). Matching Registered Nurse services with changing care demands (Match RN): study protocol of a natural experiment multi-centre study. *Journal of Advanced Nursing*, *73* (7), 1735–1746.

Bates, D., Mächler, M., Bolker, B. & Walker, S. (2014). Fitting linear mixed-effects models using lme4. *arXiv preprint arXiv:1406.5823*.

Beghi, M., Peroni, F., Gabola, P., Rossetti, A. & Cornaggia, C.M. (2013). Prevalence and risk factors for the use of restraint in psychiatry: A systematic review. *Rivista di Psichiatria*, *48* (1), 10–22.

Bernburg, M., Groneberg, D.A. & Mache, S. (2019). Mental Health Promotion Intervention for Nurses Working in German Psychiatric Hospital Departments: A Pilot Study. *Issues in Mental Health Nursing*, *40* (8), 706–711.

Bilgin, H. (2009). An evaluation of nurses' interpersonal styles and their experiences of violence. *Issues of Mental Health Nursing*, *30* (4), 252–259. https://doi.org/10.1080/01612840802710464.

Bowers, L., Allan, T., Simpson, A., Nijman, H. & Warren, J. (2007). Adverse incidents, patient flow and nursing workforce variables on acute psychiatric wards: The Tompkins Acute Ward Study. *International Journal of Social Psychiatry*, *53* (1), 75–84.

Bowers, L., Allan, T., Simpson, A., Jones, J., Van Der Merwe, M. & Jeffery, D. (2009). Identifying key factors associated with aggression on acute inpatient psychiatric wards. *Issues in Mental Health Nursing*, *30* (4), 260–271.

Cooper, C.L. & Swanson, N. (2002). *Workplace Violence in the Health Sector*. Geneva: Organización Internacional de Trabajo, Organización Mundial de la Salud, Consejo Internacional de Enfermeras Internacional de Servicios Públicos.

Cornaggia, C.M., Beghi, M., Pavone, F. & Barale, F. (2011). Aggression in psychiatry wards: a systematic review. *Psychiatry Research*, *189* (1), 10–20.

Cowman, S., Björkdahl, A., Clarke, E., Gethin, G. & Maguire, J. (2017). A descriptive survey study of violence management and priorities among psychiatric staff in mental health services, across seventeen European countries. *BMC Health Services Research*, *17* (1), 59.

Dack, C., Ross, J., Papadopoulos, C., Stewart, D. & Bowers, L. (2013). A review and meta-analysis of the patient factors associated with psychiatric in-patient aggression. *Acta Psychiatrica Scandinavica*, *127* (4), 255–268.

Di Martino, V. & Chappell, D. (2000). Violence at the workplace: the global challenge. International Conference on Work Trauma, Johannesburg.

Duncan, S.M., Hyndamn, K., Estabrooks, C.A. *et al*. (2001). Nurses' experience of violence in Alberta and British Columbia hospitals. *Canadian Journal of Nursing Research Archive*, *32* (4), 57–78. https://pubmed.ncbi.nlm.nih.gov/11928302/

Edward, K.-L., Stephenson, J., Ousey, K., Lui, S., Warelow, P. & Giandinoto, J.-A. (2016). A systematic review and meta-analysis of factors that relate to aggression perpetrated against nurses by patients/relatives or staff. *Journal of Clinical Nursing*, *25* (3–4), 289–299.

Estryn-Behar, M., Van Der Heijden, B., Camerino, D. *et al*. (2008). Violence risks in nursing—results from the European 'NEXT'Study. *Occupational medicine*, *58* (2), 107–114.

Flannery, R.B., Farley, E., Tierney, T. & Walker, A.P. (2011). Characteristics of assaultive psychiatric patients: 20-year analysis of the Assaultive Staff Action Program (ASAP). *Psychiatric Quarterly*, *82* (1), 1–10.

Gaynes, B.N., Brown, C., Lux, L.J. *et al*. (2016). *Strategies To De-escalate Aggressive Behavior in Psychiatric Patients*. Rockville, MD: Agency for Healthcare Research and Quality. https://pubmed.ncbi.nlm.nih.gov/27536754/

Gehri, B., Bachnick, S., Schwendimann, R. & Simon, M. (2021). Matching Registered Nurse services with changing care demands in Psychiatric Hospitals (MatchRN Psychiatry). Protocol of a multi-center observational study. *JMIR Research Protocols*.

Gelman, A. & Loken, E. (2016). The statistical crisis in science. *The best writing on mathematics (Pitici M, ed)*, 305–318.

Hahn, S., Müller, M., Needham, I., Dassen, T., Kok, G. & Halfens, R.J. (2010). Factors associated with patient and visitor violence experienced by nurses in general hospitals in Switzerland: a cross-sectional survey. *Journal of Clinical Nursing*, *19* (23–24), 3535–3546.

Hallett, N., Huber, J.W. & Dickens, G.L. (2014). Violence prevention in inpatient psychiatric settings: Systematic review of studies about the perceptions of care staff and patients. *Aggression and Violent Behavior*, *19* (5), 502–514.

Hamrin, V., Iennaco, J. & Olsen, D. (2009). A review of ecological factors affecting inpatient psychiatric unit violence: implications for relational and unit cultural improvements. *Issues in Mental Health Nursing*, *30* (4), 214–226.

Jacobowitz, W. (2013). PTSD in psychiatric nurses and other mental health providers: a review of the literature. *Issues in Mental Health Nursing*, *34* (11), 787–795.

Jalil, R., Huber, J.W., Sixsmith, J. & Dickens, G.L. (2017). Mental health nurses' emotions, exposure to patient aggression, attitudes to and use of coercive measures: Cross sectional questionnaire survey. *International Journal of Nursing Studies*, *75*, 130–138.

Jansen, G.J., Dassen, T.W. & Groot Jebbink, G. (2005). Staff attitudes towards aggression in health care: A review of the literature. *Journal of Psychiatric and Mental Health Nursing*, *12* (1), 3–13.

Jonker, E., Goossens, P., Steenhuis, I. & Oud, N. (2008). Patient aggression in clinical psychiatry: Perceptions of mental health nurses. *Journal of Psychiatric and Mental Health Nursing*, *15* (6), 492–499.

Morrison, E.F. (1990). Violent psychiatric inpatients in a public hospital. *Research and Theory for Nursing Practice*, *4* (1), 65–82.

Moylan, L. & Cullinan, M. (2011). Frequency of assault and severity of injury of psychiatric nurses in relation to the nurses' decision to restrain. *Journal of psychiatric and mental health nursing*, *18* (6), 526–534.

Moylan, L.B., McManus, M., Cullinan, M. & Persico, L. (2016). Need for specialized support services for nurse victims of physical assault by psychiatric patients. *Issues in Mental Health Nursing*, *37* (7), 446–450.

Nijman, H., Bowers, L., Oud, N. & Jansen, G. (2005). Psychiatric nurses' experiences with inpatient aggression. *Aggressive Behavior*, *31* (3), 217–227.

Nowrouzi-Kia, B., Isidro, R., Chai, E., Usuba, K. & Chen, A. (2019). Antecedent factors in different types of workplace violence against nurses: a systematic review. *Aggression and Violent Behavior*, *44*, 1–7.

Oud, N. (2001). *The perception of prevalence of Aggression Scale (POPAS) Questionnaire*. Amsterdam: Connecting.

Pekurinen, V., Välimäki, M., Virtanen, M., Kivimäki, M. & Vahtera, J. (2019). Work stress and satisfaction with leadership among nurses encountering patient aggression

in psychiatric care: a cross-sectional survey study. *Administration and Policy in Mental Health and Mental Health Services Research*, *46* (3), 368–379.

Pekurinen, V.M., Willman, L., Virtanen, M., Kivimäki, M., Vahtera, J. & Välimäki, M. (2017). Patient aggression and the wellbeing of nurses: a cross-sectional survey study in psychiatric and non-psychiatric settings. *International Journal of Environmental Research and Public Health*, *14* (10), 1245.

Phillips, J.P. (2016). Workplace violence against health care workers in the United States. *New England journal of medicine*, *374* (17), 1661–1669.

Renwick, L., Lavelle, M., James, K., Stewart, D., Richardson, M. & Bowers, L. (2019). The physical and mental health of acute psychiatric ward staff, and its relationship to experience of physical violence. *International Journal of Mental Health Nursing*, *28* (1), 268–277.

Ridenour, M., Lanza, M., Hendricks, S. *et al*. (2015). Incidence and risk factors of workplace violence on psychiatric staff. *Work*, *51* (1), 19–28.

Roche, M., Diers, D., Duffield, C. & Catling-Paull, C. (2010). Violence toward nurses, the work environment, and patient outcomes. *Journal of Nursing Scholarship*, *42* (1), 13–22.

Salzmann-Erikson, M. & Yifter, L. (2020). Risk factors and triggers that may result in patient-initiated violence on inpatient psychiatric units: an integrative review. *Clinical Nursing Research*, *29* (7), 504–520.

Shiao, J.-S.-C., Tseng, Y., Hsieh, Y.-T., Hou, J.-Y., Cheng, Y. & Guo, Y.L. (2010). Assaults against nurses of general and psychiatric hospitals in Taiwan. *International Archives of Occupational and Environmental Health*, *83* (7), 823–832.

Snijders, T. & Bosker, R. (2011). *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. , 2nd edn. SAGE.

Spector, P.E., Zhou, Z.E. & Che, X.X. (2014). Nurse exposure to physical and nonphysical violence, bullying, and sexual harassment: A quantitative review. *International Journal of Nursing Studies*, *51* (1), 72–84.

Stevenson, K.N., Jack, S.M., O'Mara, L. & LeGris, J. (2015). Registered nurses' experiences of patient violence on acute care psychiatric inpatient units: an interpretive descriptive study. *BMC Nursing*, *14* (1), 35.

Stoffel, M.A., Nakagawa, S. & Schielzeth, H. (2017). rptR: Repeatability estimation and variance decomposition by generalized linear mixed-effects models. *Methods in Ecology and Evolution*, *8*, 1639–1644. https://doi.org/10.1111/2041-210X.12797

The R Development Core Team (2020). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing. Available from: URL: https://www.r-project.org

Verhaeghe, S., Duprez, V., Beeckman, D., Leys, J., Van Meijel, B. & Van Hecke, A. (2016). Mental Health Nurses' attitudes and perceived self-efficacy toward inpatient aggression: A cross-sectional study of associations with nurse-related characteristics. *Perspectives in psychiatric care*, *52* (1), 12–24.

Whittington, R. & Higgins, L. (2002). More than zero tolerance? Burnout and tolerance for patient aggression amongst mental health nurses in China and the UK. *Acta Psychiatrica Scandinavica*, *106*, 37–40.

World Health Organization. (2002). Framework guidelines for addressing workplace violence in the health sector.

World Health Organization (2020). Definition and typology of violence. [Cited 18 March 2021]. Available from: URL: https://www.who.int/violenceprevention/approach/definition/en/

World Health Organization. (2021). Violence and Injury Prevention. [Cited 18 March 2021]. Available from: URL: https://www.who.int/news-room/fact-sheets/detail/injuries-and-violence

Yang, B.X., Stone, T.E., Petrini, M.A. & Morris, D.L. (2018). Incidence, type, related factors, and effect of workplace violence on mental health nurses: A cross-sectional survey. *Archive of Psychiatric Nursing*, *32* (1), 31–38. https://doi.org/10.1016/j.apnu.2017.09.013.

Zerach, G. & Shalev, T.B. (2015). The relations between violence exposure, posttraumatic stress symptoms, secondary traumatization, vicarious post traumatic growth and illness attribution among psychiatric nurses. *Archives of Psychiatric Nursing*, *29* (3), 135–142. https://doi.org/10.1016/j.apnu.2015.01.002.

Zhang, L., Wang, A., Xie, X. *et al*. (2017). Workplace violence against nurses: A cross-sectional study. *International Journal of Nursing Studies*, *72*, 8–14.

TABLE A1 *Generalized linear mixed model to check whether nurses' age provides a meaningfully different from professional experience*

	Verbal violence		Verbal sexual violence		Violence against property		Physical sexual violence		Physical violence	
Variable	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value
Gender										
Male	1.39 (0.91–2.13) –		0.50 (0.34–0.72)	0.00***	1.09 (0.56–2.08)	0.99	0.61 (0.38–0.98)	0.04	1.35 (0.91–2.02)	0.14
Female (reference)		0.12	–	–	–	–	–	–	–	–
Education										
Licensed practical nurses	1.57 (0.81–3.05)	0.18	0.81 (0.50–1.34)	0.42	0.40 (0.23–0.70)	0.00**	1.36 (0.76–2.46)	0.3	1.00 (0.60–1.76)	0.99
Registered nurses (reference)	–	–	–	–	–	–	–	–	–	–
Employment Percentage										
10–60	0.55 (0.32–0.96)	0.03*	1.21 (0.76–1.91)	0.42	0.52 (0.31–0.87)	0.01*	0.57 (0.31–1.06)	0.07	0.49 (0.28–0.88)	0.02*
61–95	0.71 (0.47–1.07)	0.1	0.98 (0.69–1.39)	0.92	0.80 (0.54– 1.19)	0.28	0.69 (0.44–1.08)	0.1	0.76 (0.52–1.14)	0.18
100 (reference)	–	–	–	–	–	–	–	–	–	–
Nurses age (years)										
17–24	4.35 (1.73–9.98)	0.00***	8.47 (4.33–9.98)	0.00***	3.42 (1.59–7.36)	0.00**	1.56 (0.64–3.78)	0.32	1.20 (0.56–2.61)	0.68
25–34	1.93 (1.16–3.18)	0.01*	5.22 (3.22–8.49)	0.00***	2.41 (1.48–3.93)	0.00***	2.05 (1.05–4.02)	0.03*	1.85 (1.04–3.27)	0.04*
35–44	1.93 (1.11–3.37)	0.02*	2.45 (1.44–4.16)	0.00***	2.38 (1.37–4.13)	0.00**	1.91 (0.92–3.98)	0.09	2.26 (1.21–4.23)	0.01*
45–54	1.67 (0.99–2.83)	0.06	1.98 (1.17–3.36)	0.01*	1.82 (1.08–3.07)	0.02*	2.27 (1.11–4.63)	0.02*	2.47 (1.35–4.54)	0.00**
55–67 (reference)	–	–	–	–	–	–	–	–	–	–
Severe forms of psychiatric inpatient violence in history										
Physical attack	1.77 (1.10–2.84)	0.02*	1.84 (1.27–2.66)	0.00**	1.63 (1.05–2.53)	0.03*	1.79 (1.15–2.80)	0.01*	1.77 (1.18–2.66)	0.00**
Sexual assault	2.84 (0.92–8.82)	0.07	3.60 (1.69–7.67)	0.00***	2.12 (0.87–5.15)	0.09	3.76 (1.86–7.59)	0.00***	1.27 (0.59–2.71)	0.54
No history (reference)	–	–	–	–	–	–	–	–	–	–
Perception that inpatient violence is part of the job	1.05 (0.98–1.13)	0.19	1.13 (1.07–1.20)	0.00***	1.08 (1.01–1.15)	0.03*	1.07 (0.99–1.15)	0.06	1.10 (1.04–1.18)	0.00**

Note.: OR = odds ratio; CI = confidence interval (2.5-97.5%).

*$P < 0.05$.

**$P < 0.01$.

***$P < 0.001$.

TABLE A2 *Generalized linear mixed model to check whether unit work-environment characteristics (leadership, team climate and safety climate) substantially affect the models' parameters*

	Verbal violence		Verbal sexual violence		Violence against property		Physical sexual violence		Physical violence	
Variable	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Gender										
Male	1.30 (0.83–2.02)		0.48 (0.33–0.70)	0.00***	0.91 (0.60–1.40)	0.89	0.66 (0.40–1.07)	0.06	1.44 (0.94–2.20)	0.13
Female (reference)	–	0.23	–	–	–	–	–	–	–	–
Education										
Licensed practical nurses	1.39 (0.68–2.85)	0.37	1.04 (0.62–1.73)	0.4	0.39 (0.21–0.72)	0.00**	1.34 (0.73–2.48)	0.19	1.04 (0.57–1.90)	0.62
Registered nurses (reference)	–	–	–	–	–	–	–	–	–	–
Employment Percentage										
10-60	0.45 (0.25–0.81)	0.00**	1.05 (0.66–1.68)	0.49	0.50 (0.28–0.88)	0.05*	0.54 (0.28–1.04)	0.11	0.62 (0.34–1.14)	0.03
61-95	0.66 (0.42–1.02)	0.06	0.84 (0.59–1.20)	0.66	0.81 (0.53–1.25)	0.38	0.69 (0.44–1.10)	0.08	0.93 (0.61–1.43)	0.23
100 (reference)	–	–	–	–	–	–	–	–	–	–
Professional experience (years)										
≤3	3.63 (1.90–6.96)	0.00***	3.40 (2.03–5.68)	0.00***	3.07 (1.69–5.56)	0.00**	1.92 (0.95–3.83)	0.21	1.13 (0.61–2.08)	0.66
>3-≤7	1.62 (0.90–2.92)	0.1	3.58 (2.14–5.98)	0.00***	2.36 (1.32–4.22)	0.00***	1.80 (0.89–3.61)	0.04*	1.39 (0.75–2.58)	0.03*
>7-≤15	1.68 (0.99–2.82)	0.06	2.59 (1.61–4.18)	0.00**	2.58 (1.52–4.36)	0.00**	1.89 (0.97–3.65)	0.08	1.37. (0.77–2.42)	0.01*
>15-≤20	2.70 (1.43–5.11)	0.00**	1.61 (0.93–2.78)	0.02*	2.69 (1.40–4.99)	0.04*	2.57 (1.27–5.17)	0.03*	1.01 (0.51–1.95)	0.00**
>20 (reference)	–	–	–	–	–	–	–	–	–	–
Severe forms of psychiatric inpatient violence in history										
Physical attack	1.59 (0.97–2.60)	0.06	1.79 (1.22–2.62)	0.00***	1.90 (1.18–3.05)	0.02*	1.63 (1.02–2.61)	0.00**	2.09 (1.35–3.23)	0.00**
Sexual assault	2.66 (0.85–8.29)	0.09	4.29 (1.95–9.48)	0.00***	2.65 (0.95–7.39)	0.12	4.60 (2.18–9.71)	0.00***	1.37 (0.61–3.05)	0.35
No history (reference)	–	–	–	–	–	–	–	–	–	–
Perception that inpatient violence is part of the job	1.02 (0.95–1.11)	0.54	1.11 (1.05–1.18)	0.00***	1.09 (1.01–1.17)	0.04*	1.07 (0.98–1.15)	0.05*	1.11 (1.04–1.19)	0.00**
Leadership on Unit-level										
Moderate	0.92 (0.42–2.02)	0.82	1.17 (0.67–2.04)	0.39	0.94 (0.45–1.98)	0.7	0.96 (0.49–1.88)	0.79	0.59 (0.28–1.21)	0.16
Excellent	0.66 (1.24–1.76)	0.4	0.72 (0.35–1.49)	0.54	0.73 (0.28–1.91)	0.96	1.26 (0.53–2.94)	0.57	0.75 (0.28–2.00)	0.57
Poor (reference)	–	–	–	–	–	–	–	–	–	–
Team climate on Unit-level										
Moderate	2.14 (0.61–7.57)	0.23	1.05 (0.44–2.49)	0.96	1.38 (0.40–4.69)	0.6	1.07 (0.37–3.08)	0.93	2.13 (0.62–7.27)	0.4
Excellent	1.85 (0.45–7.54)	0.39	1.58 (0.58–4.26)	0.4	1.27 (0.32–4.95)	0.88	1.39 (0.41–4.77)	0.6	1.84 (0.44–7.59)	0.5
Poor (reference)	–	–	–	–	–	–	–	–	–	–
Safety climate on Unit-level										
Moderate	0.59 (0.18–1.97)		0.72 (0.31–1.65)	0.54	0.66 (0.20–2.17)	0.4		0.25		0.31
Excellent	0.76 (0.18–3.19)	0.39	0.71 (0.26–1.94)	0.51	0.81 (0.20–3.18)	0.61	0.57 (0.21–1.58)	1.18	0.38 (0.12–1.24)	0.59
Poor (reference)	–	0.71	–	–	–	–	0.45 (0.13–1.54)	–	0.50 (0.12–2.02)	–

Abbreviations O, odds ratio; CI, confidence interval (2.5–97.5%).

*$P < 0.05$.

**$P < 0.01$.

***$P < 0.001$.